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#### Prior art

Conventionally, it is widely known that a hair detergent functions to wash off dirt, dandruff, and so on adhered on hair or the scalp as an essential purpose and is used with an objective to keep hair clean. Most of the washing function is due to a surfactant, that is, a detergent active component, blended in the detergent. Therefore, the selection of the detergent active component controls the performance quality of the detergent.

The substances mainly used now in the detergents among the surfactants are anionic surfactants. As their typical examples, substances obtained by blending of lauryl sulfuric acid sodium salt, lauroyl sarcosine sodium salt, a linear alkylbenzenesulfonic acid sodium salt,  $\alpha$ -olefinsulfonic acid sodium salt, or the like in lauryl sulfuric acid triethanolamine or other alkyl lauryl sulfuric acid triethanolamines, alkyl ether sulfuric acid sodium salt or the like in bases have been used frequently.

On the other hand, product states of the detergents marketed now are virtually all liquid state, a gel state containing water, or a paste state. For these detergents in the liquid state or the like, in order to ascertain their agent states, a freezing inhibitor, a hydrotrope, an emulsifier, a chelating agent, an ultraviolet absorb, a coloring matter, and so on are added in a considerable amount in addition to the detergent active component.

Recently, the requirement of higher safety with respect to detergents has been strong. In addition, the required functions have been diversified into "keeping clean after washing," "superior finishing feel in addition to a clean feeling after hair washing," as well as "rendering a pharmaceutically effective effect," such as dandruff removal, itch prevention, etc.

In addition to hair detergents, hair cultivating agents and hair growing agents are also numerously marketed. It is widely known that these are obtained by mixing salicylic acid or other keratin dissolving agents, Asian puccoon extract or other anti-inflammatory disease agents, acetylcholine derivatives or other vasodilators, urea or other moisturizing agents, cell activators, wound treating agents, cephalanthin or other skin function improving agents, copper pantothenate or other melanin synthesis catalysts, as well as a sterilizing agent, a blood circulation improving agent, vitamins, an amino acid, female hormones or the like.

#### Problems to be solved by the invention

The pharmaceutically effective components mentioned previously are effective in the prevention or improvement of dandruff, itching, hair removal, etc. They have been used in the promotion of hair generation or hair growth and the prevention of skin roughness by retaining skin moisture. However, substances achieving a satisfactory effectiveness have not been obtained to date.

Furthermore, these conventional pharmaceutically effective components have often been used in hair preparations focusing on a hair cultivating agent, a hair growing agent, a hair tonic, a hair rinse and so on, as well as an ointment, a liquid cream, a shaving cream, etc. In particular, in the case of men, even if a detergent is used indispensably during hair washing, it is rare to use a rinse for other materials. In regard to the usage of a hair cultivating agent or a hair-growing agent, their scope is extremely restricted. Since these agents are separate from detergents, double or triple the time will be needed during their usage. With the preceding problems, there is a disadvantage in which the opportunity of usage is lost.

Moreover, for many hair detergents now, their states are liquid. Furthermore, virtually all hair cultivating agents, hair growing agents, hair tonics, or other preparations expected to have pharmaceutical effectiveness are in a liquid state. Therefore, first, the concentration of the effective component is also a low concentration. It goes without saying that the remainder is water or an organic solvent. This is not economical in many aspects. In particular, the volume or the weight of the product is increased, and it is necessary to use a strong container. There is a disadvantage in which the container cost and the transportation cost constitute a major portion of the product price. Secondly, it is common that, in order to satisfy usage feel, usage characteristics and the like and to ascertain the liquid state or other agent forms, a freezing inhibitor, a thickener, a hydrotrope, an emulsifier, a chelating agent, an ultraviolet absorber, a stabilizer, coloring matter, and materials other than the original detergent active components and components expected to have pharmaceutical effectiveness are contained in various types and ways in considerable amounts. There is a disadvantage in which scalp irritation, skin irritation and other harmful cases may occur occasionally. Thus, the present invention has objectives to render an effect of a hair-cultivating agent to a hair detergent, to save time by simplification in the usage of a detergent, a hair-cultivating agent and a hair-growing agent in combination, and to eliminate a variety of unnecessary components for hair detergents.

#### Means to solve the problems

In order to achieve the previously mentioned objectives altogether, the present inventors have focused the synergistic effect of a ginger extract as a pharmaceutically effective component that is selectively adsorbed and remains on hair and scalp without being washed off during washing, and carbon dioxide gas known to have a blood circulation improving effect and a peripheral vasodilation effect and also used clinically now in rehabilitation as a carbon dioxide gas bath. As a result of the accumulation of zealous investigations, it has been discovered unexpectedly that this combination has a surprising pharmaceutical effect, that is, a remarkable effect with respect to hair cultivation and hair growth. This discovery is applied to hair detergent, and the present invention has been accomplished. In other words, the constitution of the present

invention is a solid novel hair detergent composition obtained by blending a carbon dioxide gas generating substance, a ginger extract, and a water-soluble polymeric substance as necessary components.

As the detergent active component for use in the solid hair detergent of the present invention, a surfactant or soap can be used. It is preferable that the synthetic surfactant be a substance that foams well and can be used even in hard water without damaging the washing effect in both an acidic case or an alkaline case. Anionic surfactants are preferred. For example, as alkyl sulfuric acid salts, lauryl sulfuric acid sodium salt, lauryl sulfuric acid potassium salt, myristyl sulfuric acid sodium salt, cetyl sulfuric acid sodium salt, stearyl sulfuric acid sodium salt, hardened coconut oil fatty acid glyceryl sulfuric acid sodium salt, and so on can be mentioned. In particular, lauryl sulfuric acid sodium salt and cetyl sulfuric acid sodium salt are preferred. In addition, as preferred anionic surfactants, an  $\alpha$ -olefinsulfuric acid salt, a methyltaurine derivative, an amino acid type detergent, a polyoxyethylene alkyl ether sulfuric acid salt and so on can be mentioned. As the polyoxyethylene alkyl ether sulfuric acid salts, though in a liquid state, polyoxyethylene lauryl ether sulfuric acid salt, polyoxyethylene lauryl ether sulfuric acid triethanolamine, and so on can be mentioned. As N-acylamino acids and their salts, lauroylsarcosine, lauroylsarcosine sodium salt, myristylsarcosine sodium salt, palmitoylsarcosine sodium salt, and so on can be mentioned. Especially preferred is lauroylsarcosine sodium salt. As N-acyl methyltaurine salts, N-lauroyl methyltaurine sodium salt, N-myristyl methyltaurine sodium salt, N-palmitoyl methyltaurine sodium salt, N-stearyl methyltaurine sodium salt, and so on can be mentioned. Especially preferred is N-lauroyl methyltaurine sodium salt. Furthermore, though in a liquid state, lauryl sulfuric acid triethanolamine can also be used. In addition, 2-ethylhexyl sulfosuccinic acid sodium salt and other alkyl sulfocarboxylic acid salts,  $\alpha$ -olefinsulfonic acid sodium salt and other  $\alpha$ -olefinsulfonic acid salts, lauryl phosphoric acid sodium salt and other alkyl phosphoric acid salts, polyoxyethylene alkyl acetic acid salts, polyoxyethylene lauryl ether phosphoric acid sodium salt, polyoxyethylene cetyl ether phosphoric acid sodium salt and other polyoxyethylene alkyl ether phosphoric acid salts, coconut oil fatty acid collagen peptide and other acyl collagen peptide salts, and so on can also be used. Substances that are liquids at ambient temperature can be used in the range such that a solid is maintained when they are blended with other blending components. The above anionic type surfactants can be used alone or in combination of two or more or in combination with other detergent active components. As surfactants that can be used together with the anionic type surfactants, amphoteric surfactants and nonionic surfactants are available.

On the other hand, soaps can also be used as detergent active components. Alkali salts of one or more of caprylic acid, capric acid, lauric acid, myristic acid, palmitic acid, stearic acid,

oleic acid, linolic acid, ricinoleic acid, and other higher fatty acids, preferably, salts of caustic soda or potassium hydroxide with lauric acid, myristic acid, palmitic acid, stearic acid, and oleic acid are used. Among these, potassium soaps are in a paste form. The soap can also be used by dilution at an appropriate ratio with sodium carbonate, borax, sesquisodium carbonate, sodium phosphate, saponin, glue, flour, starch, etc.

The amount of addition and blending of a detergent active component of the present invention is 5-50 wt% (to be abbreviated to simply % hereafter), preferably 10-30%, with respect to the total amount of the detergent composition. If it is less than 5%, it is undesirable since both the washing effectiveness and the foaming power are decreased. On the other hand, if it is more than 50%, it is undesirable since hair damage, scalp irritation, and other hindrances occur easily. The blending amount can be decided from viewpoints of the washing effectiveness, the foaming amount, and the foam durability. The carbon dioxide gas-generating substance that can be used in the present invention consists of a substance as a carbon dioxide gas generating source and a compound that causes the generation of carbon dioxide gas by action on this.

As carbon dioxide gas generating sources that can be used in the present invention, a variety of carbonates are available. Specifically, for example, sodium bicarbonate, sodium carbonate, sesquisodium carbonate, potassium bicarbonate, potassium carbonate, sesquipotassium carbonate, ammonium bicarbonate, ammonium carbonate, sesquiammonium carbonate, and so on can be mentioned. These can be used alone or in combination of two or more. Among these, sodium bicarbonate and sodium carbonate are most preferred from aspects of stable supply characteristics, cost, washing characteristics, rinsing characteristics, etc. The amount of addition and blending of the compound of this carbon dioxide gas source is in the range of 20-45%, most preferably 25-40%, with respect to the total amount of the detergent composition of the present invention. If it is less than 20%, it is undesirable since the generated amount of carbon dioxide gas is small, the foam durability is decreased, and the washing effectiveness and the pharmaceutical effectiveness are both reduced. On the other hand, if it is more than 45%, it is undesirable since the generated amount of carbon dioxide gas is large, and a case may occur in which not only the original washing effectiveness of the detergent is diluted but also it causes to an uncomfortable feeling for some people.

On the other hand, in the case of addition of water into the detergent of the present invention, its system is made acidic. In the end, as a compound for the generation of carbon dioxide gas, either an organic acid or an inorganic acid can be used. Among these, a substance in a solid form is preferred. As specific examples of organic acids, for example, formic acid, acetic acid, propionic acid, butyric acid, valeric acid or other linear aliphatic acids; oxalic acid, malonic acid, succinic acid, glutaric acid, adipic acid, pimelic acid, fumaric acid, maleic acid, phthalic acid, terephthalic acid or other dicarboxylic acids; glutamic acid, aspartic acid or other acidic

amino acids, glycolic acid, lactic acid, hydroxyacrylic acid,  $\alpha$ -oxybutyric acid, glyceric acid, tartronic acid, malic acid, tartaric acid, citric acid, salicylic acid, gallic acid, mandelic acid, tropic acid, ascorbic acid, gluconic acid, or other oxy acids; cinnamic acid, benzoic acid, phenylacetic acid, nicotinic acid, guinic acid, sorbic acid, pyrrolidonecarboxylic acid, trimellitic acid, benzenesulfonic acid, toluenesulfonic acid, as well as acidic salts of these organic acids can be mentioned.

On the other hand, as inorganic acids, for example, phosphoric acid, potassium dihydrogen phosphate, sodium dihydrogen phosphate, sodium sulfite, potassium sulfite, sodium pyrosulfite (sodium metabisulfite), potassium pyrosulfite (potassium metabisulfite), acidic hexametaphosphoric acid sodium salt, acidic hexametaphosphoric acid potassium salt, acidic pyrophosphoric acid sodium salt, acidic pyrophosphoric acid potassium salt, sulfamic acid and so on can be mentioned. Among these, the preferred ones are oxy acids and dicarboxylic acids. Furthermore, the most preferred acids among these are basically organic acid salts from the viewpoints of low irritation, mildness, the point of pH set in the case of the addition of water, the shape of the foam generated, the durability of the foam state, etc. Specifically, citric acid, succinic acid, tartaric acid, malic acid, glutamic acid, gluconic acid and other dicarboxylic acids, oxy acids, acidic amino acids and so on are preferred. The amount of addition and blending of an acid is basically an equivalent amount of the carbonate or an amount close to this from the viewpoints of acidity, that is, pH, required in the case of the addition of water, the amount of the foam generated, the durability of the foam generated, and so on, as described previously. It is appropriate in the range of 25-45%, most preferably 25-40%, with respect to the total amount of the detergent composition of the present invention. Furthermore, by the adjustment of the amounts of the carbonate and the acid in the present invention, the pH of the carbon dioxide gas-generating atmosphere can be adjusted. At the same time, the rate of the carbon dioxide gas generation and the durability of the foam generated can also be adjusted. However, the sum of the amounts of the carbonate and the acid is acceptable in the range of 40-90% with respect to the total amount of the detergent composition of the present invention. Preferably, they are added and blended so that the sum is 50-80%. Another necessary component is a component extracted from raw ginger and as a pharmaceutically effective component that is selectively adsorbed on scalp and hair without being washed off at all during washing. The effectiveness of this substance is something discovered by the present inventors. The amount of addition and blending of this substance is in the range of 0.1-3%, preferably 1-2%, with respect to the total amount of the detergent composition of the present invention. If it is less than 0.1%, the discovery of the synergistic effect with carbon dioxide gas is not realized. Furthermore, even if it is more than 3%, an increase in effectiveness beyond this cannot be achieved in a desirable manner.

The extracted component of the raw ginger that can be used appropriately in the present invention refers to the substance that is obtained by a manufacturing method to be described later. First of all, the raw ginger and kurenohajikami [transliteration] that can be used appropriately in the present invention are those produced domestically or abroad, and they can be used irrespective of their crop seasons. As the utilized parts of the raw ginger, root and stem parts are especially effective.

The manufacturing method and the extracting method for the extracted component of the raw ginger that can be used appropriately in the present invention are basically the methods described in Japanese Pharmacopeia explanation sheets. The examples of the manufacturing and extracting methods are given in Reference Examples 1-4 to be described later. Yet another necessary component is a water-soluble polymeric substance. This is used to control increased foaming, foam duration, foaming (before and after) and other foam properties, to achieve a refreshed and good feeling for washed hair without stickiness, and to improve the feel during use. As the water-soluble polymeric substances, a variety of gums, gelatin, starch or other natural substances, cellulose derivatives, synthetic polymers and so on can be used. As natural substances, gum arabic, guaiac resin, karaya gum, tragacanth gum, danmaru [transliteration] gum, and other gums, agar-agar, casein, gelatin, pectin, sodium pectate, sodium alginate, dextrin, starch and so on can be used. A modified starch can also be used. As cellulose derivatives, methylcellulose, ethylcellulose, carboxymethyl cellulose, carboxyethylcellulose sodium salt, hydroxyethyl cellulose, hydroxypropylcellulose, and so on can be mentioned. Although microcrystalline cellulose is not water-soluble, it has a property which controls the properties of foam. It can be used in combination with other water-soluble polymers. As synthetic water-soluble polymeric compounds, polyvinyl alcohol, polyvinylpyrrolidone, polyacrylic acid sodium salt, carboxyvinyl polymer, polyethylene imine, polyethylene glycol, and so on can be mentioned. As preferred among these, those exhibiting some thickening characteristics are acceptable. The amount of addition and blending is in the range of 5% as the upper limit and 0.1% as the lower limit, preferably in the range of 0.2-3%, with respect to the total amount of the detergent composition of the present invention.

As other components that can be added and blended into the hair detergent composition of the present invention, a vehicle, a pharmaceutically effective component other than raw ginger, a casing inhibitor, a detergency reinforcing agent, a recontamination inhibitor, a surface tension reducing agent, a deodorizing agent, and so on can be mentioned. After careful investigations, the material to be blended is a vehicle. The purpose of using the vehicle is to render dispersion, bulk weight, as well as effective dispersion, effective utilization, and a variety of other functions of the detergent active components. Therefore, basically, a water-soluble substance is preferred. As specific examples, saccharides, preferably maltose, mannitol, lactose,

or other monosaccharides, polysaccharides and so on can be mentioned. The amount of addition and blending of this is appropriate in the range of 1-30%, most preferably in the range of 5-20%, with respect to the total amount of the detergent composition of the present invention.

As pharmaceutically effective components that are effective in hair cultivation, hair growth and so on for use in combination with the raw ginger extract in combination in the present invention, they can be classified into, for example, a keratin dissolving agent acting on a corneum and surface skin system, a sterilizer, and an anti-inflammatory agent. Specifically, salicylic acid, urea, resorcin, glycyrrhizic [transliteration] acid, and so on can be mentioned. As substances classified as cell activators acting on hair mother cells and the peripheral environment system, specifically, mononitroguaiacol, amino acids, pantothenic acid derivatives, Korean ginseng, estradiol as a female hormone, and so on can be mentioned. Furthermore, as substances classified as blood circulation improving agents and peripheral vasodilation acting agents, specifically, calpronium [transliteration] chloride, a senpuri [transliteration] extract, capsicum tincture, vitamins, reisogen [transliteration], as well as raw medicines, essential oil raw medicines, such as kanokoso [transliteration], kamitsure [transliteration], gaiyo [transliteration], kanbi [transliteration], uikyo [transliteration], keigai [transliteration], cinnamon, cinnamon oil, shokyo [transliteration] powder, jasmine, senkyu [transliteration], shobu [transliteration], shobu [transliteration] oil, sojutsu [transliteration], terepin [transliteration] oil, chinbi [transliteration], toki [transliteration], tohi [transliteration], tohi [transliteration] oil, dokukatsu [transliteration], byakushi [transliteration], byakujutsu [transliteration], sun tree oil, pine oil, peppermint leaves, peppermint oil, bergamot, matsubusa [transliteration], lavender oil, ryuno [transliteration]; as glycoside raw medicines, ougon [transliteration], safran [transliteration], juyaku [transliteration]; as saponin raw medicines, carrots; as alkaloid raw medicines, oupaku [transliteration] extract, kyoboku [transliteration]; as other raw medicines, shakuyaku [transliteration], sanshin [transliteration], bukuryo [transliteration], and so on can be used.

Furthermore, as caking inhibitors, polyols can be used preferably. Specifically, propylene glycol, 1,3-butanediol, glycerol and so on can be mentioned.

Furthermore, as oil components acting as emollients in the hair detergent composition of the present invention, rice bran oil, olive oil, soybean oil, liquid paraffin, white petrolatum, stearyl alcohol, rice bran extract; as polymeric components acting as binding agents, moisture-maintaining agents, and emollient agents, yolk powder, skim powder milk, rice bran extract; as other drug agents acting as local stimulants and sterilizing agents, dl-menthol, l-menthol, d-camphor, dl-camphor, methyl salicylate, salicylic acid, sodium salicylate, benzoic acid, and so on; as extenders and buffer agents, inorganic salts and so on generally added into detergents can also be added.



The preferred manufacturing methods for the hair detergent composition of the present invention will be exemplified [below].

A detergent active component, a carbon dioxide generating substance, a raw ginger extract, as well as a pharmaceutically effective component, a water-soluble polymer, a vehicle, and other blending agents are prepared. Solid substances are pulverized separately beforehand. Then, they are mixed together. While they are being pulverized, they are thoroughly mixed. Next, if necessary, a perfume or the like can be added and blended. Alternatively, the powders may also be molded into granules or tablets. As particle diameters in this case, those with more than 100  $\mu\text{M}$  are preferred even for the powder form. Furthermore, it is a necessary condition that the so-called solid hair detergent composition whether granular form, powder form, tablet form, or the like does not contain water in the system. It does not matter at all that nonaqueous solvents, such as alcohols, acetone, or solvents inert with respect to a carbonate and an acid, such as polyhydric alcohols, ethers and so on can be contained in a range that maintains the solid state of the composition.

#### Operation

The solid hair detergent composition of the present invention is used in a solid form as such. It is used together with water during usage. It is necessary to adjust the amounts of the carbon dioxide gas generating source and the acid so that the pH is weakly acidic when water is added. In the case in which the system is acidic, the carbon dioxide gas generating source is decomposed and carbon dioxide gas ( $\text{CO}_2$ ) is generated. When the system is on the alkaline side, the carbon dioxide gas source can exist in water as  $\text{CO}_3^{2-}$  ions or  $\text{HCO}_3^{-1}$  ions and thus the generation of  $\text{CO}_2$  is inhibited. When water is added into the solid hair detergent composition of the present invention, the pH of the system is 3-7, preferably 5.0-6.7, in the vicinity of the high electric point of hair or scalp. Therefore, carbon dioxide gas is generated from the inside of the solid detergent owing to this. The detergent active component dissolved in water is effectively foamed. In doing this, the original washing effectiveness is doubled. At the same time, a certain type of stimulation is rendered to the scalp and hair accompanied with a comfortable feeling during use. Thus, blood circulation and peripheral vasodilation effects are accelerated. Furthermore, owing to the synergistic effect with the raw ginger extract, hair cultivation and hair growth effectiveness can be expected. The reasons for the achievement of the hair cultivation and hair growth effectiveness by carbon dioxide gas and the raw ginger extract and their effects are not clarified. However, it is believed that there is a synergistic effect between the selective adsorption of the raw ginger extract on scalp and hair and the stimulation of carbon dioxide gas, in the end, the stimulation due to good foaming by the generation of carbon dioxide gas.

### Application examples

The novel hair detergent composition of the present invention will be explained specifically with application examples in the following. However, the present invention is not to be restricted to these application examples, of course.

In the following, parts and % are on a weight basis unless specified otherwise. First of all, manufacturing examples for the raw ginger extract will be given in Reference Examples 1-4.

#### Reference Example 1

Roots and stems of commonly marketed raw ginger were scraped off and subjected to centrifugal separation. The filtrate portion was used as such as an extract component of raw ginger and raw [?].

#### Reference Example 2

Roots and stems of 100 g of commonly marketed raw ginger and raw [?] were scraped off. They were subjected to warm immersion and extraction in 1 L acetone at 50°C for about 5 h. This extraction operation was repeated three times. The extract solutions were combined and concentrated at 40°C under reduced pressure to prepare a crude product. This crude product was dissolved in 100 mL hot water and filtered. After the filtrate had been cooled, it was mixed and with 200 mL ethyl ether and stirred. This operation was repeated five times. The ether layer obtained from this was collected and the solvent was distilled off under reduced pressure. The residue was dissolved in water, and recrystallization was repeated. The desired extract of the raw ginger was obtained. The yield was about 10 g.

#### Reference Example 3

Roots and stems of 100 g of commonly marketed raw ginger were scraped off. They were subjected to extraction in 5 L of a mixed solution (1:1) of acetone and water at room temperature for two days. This extraction operation was repeated three times. The extract solutions were combined and concentrated at 40°C under reduced pressure to prepare a crude product. This crude product was subjected to extraction again with ethyl acetate. The extract was concentrated at 50°C under reduced pressure. This concentrated material was dissolved in warm water (80-100°C) and filtered. Water was removed from this filtrate, and an extract component of the raw ginger was obtained. The yield was about 10 g.

#### Reference Example 4

Roots and stems of 100 g of commonly marketed raw ginger were scraped off. They were subjected to extraction in 5 L of a mixed solution (3:7) of acetone and water at room temperature

for two days. This extraction operation was repeated three times. The extract solutions were combined and concentrated at 40°C under a reduced pressure to prepare a crude product. This crude product was subjected to extraction again with n-butanol. The extract was concentrated under reduced pressure. This concentrated material was then dissolved in warm water (80-100°C) and the insoluble material was filtered off. This operation was repeated three times. Water was removed from the filtrate, and an extract component of the raw ginger was obtained. The yield was about 3 g.

#### Application Example 1

In the blend of the following table, first of all, detergent active components were thoroughly mixed while they were pulverized in a crucible. Next, components other than carbonates were added and thoroughly pulverized and mixed. The carbonates were pulverized in a separate crucible to a microfine powder. They were then combined with the components that had been pulverized and mixed previously, and mixed thoroughly to yield a solid hair detergent in a microfine powder form.

① 成 分	含 量 ( 重量 %) ②
③ ラウリル硫酸ナトリウム	5
ラウロイルサルコシン ナトリウム	3
α - オレフィンスルホン酸 ナトリウム	3
④ 炭酸水素ナトリウム	30
⑤ 炭酸ナトリウム (無水)	10
クエン酸 (無水)	38
生薑抽出エキス成分 (参考例 1 のもの)	1.4
⑥ グリチルリチン酸 ジカリウム塩	0.1
ガム質成分 (ケルテロール)	1.5
ポリオキシプロピレン縮合物 (プロニック F 68)	5
⑦ ポリエチレングリコール (分子重量約 2 万)	3
⑧ 計	100

- Key: 1 Component  
 2 Content (wt%)  
 3 Lauryl sulfuric acid sodium salt  
 Lauroylsarcosine sodium salt  
 α-olefinsulfonic acid sodium salt  
 4 Sodium bicarbonate  
 5 Sodium carbonate (anhydrous)  
 Citric acid (anhydrous)  
 Raw ginger extract component (material from Reference Example 1)  
 6 Glycyrrhizic [transliteration] acid dipotassium salt  
 Gum component (Keruterol [transliteration])  
 Polyoxypropylene condensate (Pronick [transliteration] F68)  
 7 Polyethylene glycol (molecular weight about 20,000)  
 8 Total

### Application Example 2

A powdered solid hair detergent was obtained in the same manner as in Application Example 1 except that no polyethylene glycol (molecular weight about 20,000) was used in Application Example 1.

### Application Examples 3-5

Powdered solid hair detergents were obtained from the following component blends by the same pulverizing-mixing method as that in Application Example 1.

① 成分	② 含量 (重量%)		
	実施例 - 3	実施例 - 4	実施例 - 5
④ ラウリル硫酸ナトリウム	③ 5	③ 3	③ 3
α-オレフィンスルホン酸ナトリウム	3	3	3
N-ラウロイルメチルタウリンナトリウム	0	0	5
N-ヤシ油脂肪酸アシル-L-グルタ ミン酸モノナトリウム (アミソフトCS-11)	5	5	0
炭酸水素ナトリウム	30	30	30
炭酸ナトリウム	10	10	10
クエン酸	39	39	39
生薑抽出エキス成分 (参考例2のもの)	1.4	1.4	1.4
グリチルリチン酸ワカリウム塩	0.1	0.1	0.1
ガム質成分 (ケルテロール)	1.5	1.5	1.5
ポリオキシプロピレン縮合物 (プロニックF-68)	5	5	5
ポリエチレングリコール (分子量約2万)	0	2	2

- Key: 1 Component  
 2 Content (wt%)  
 3 Application Example  
 4 Lauryl sulfuric acid sodium salt  
 α-Olefinsulfonic acid sodium salt  
 N-Lauroyl methyltaurine sodium salt  
 N-Coconut oil fatty acid acyl-L-glutamic acid monosodium salt (Amisoft  
 [transliteration] CS-11)  
 Sodium bicarbonate  
 Sodium carbonate  
 Citric acid  
 Raw ginger extract component (material from Reference Example 2)

Glycyrrhizic acid dipotassium salt  
 Gum component (Keruterol)  
 Polyoxypropylene condensate (Pronick F-68)  
 Polyethylene glycol (molecular weight about 20,000)

### Application Examples 6-17

Powdered solid hair detergents were obtained from component blends in the following table by the same means as that in Application Example 1.

①成分	実施例②		③含量 (部 重 量 部)														
	6	7	8	9	10	11	12	13	14	15	16	17					
ラウリル硫酸ナトリウム			3	6			3										
α-オレフィンスルホン酸ナトリウム	3	3			8			2		3		3					
N-ラウロイルメチルタウリンナトリウム	5	5				8		10		3		5					
N-ヤシ油脂肪酸アシル-L-グルタミン酸ナトリウム					5												
ラウロイルサルコシンナトリウム			12	3		10	6	3	2								
硬化ヤシ油脂肪酸グリセリル硫酸ナトリウム			5				3										10
イセチオン酸ナトリウム	5	5							10								
スルホコハク酸ラウリル2-ナトリウム												8					
ポリオキシエチレン、プロピレブロッグ重合体	5	5		5	3		3	3	3	3							
炭酸水素ナトリウム	30	30	30	30	30	30	30	30	30	30	30	30					
炭酸ナトリウム	10	10	10	10	10	10	10	10	10	10	10	10					
クエン酸									34								
フマル酸	34	30	34	34						30							
ハコク酸												34					
d-リシゴ酸					34	34		34									34
生薬抽出エキス成分	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮	⑯	⑰
グリチルリチン酸ジカリウム	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
ポリエチレングリコール (分子量2万)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
ガム成分	3					3											3
	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1

⑤は ○に数字は各生薬エキス製造の参考例の番号を示すものである。

- Key:
- Component
  - Application Example
  - Content (parts by weight)
  - Lauryl sulfuric acid sodium salt  
 α-Olefin sulfonic acid sodium salt  
 N-Lauroyl methyl taurine sodium salt  
 N-Coconut oil fatty acid acyl-L-glutamic acid sodium salt  
 Lauroylsarcosine sodium salt  
 Hardened coconut oil fatty acid glyceryl sulfuric acid sodium salt  
 Isethionic acid sodium salt  
 Sulfosuccinic acid lauryl 2-sodium salt  
 Polyoxyethylene-propylene block polymer  
 Sodium bicarbonate  
 Sodium carbonate  
 Citric acid  
 Fumaric acid

- Succinic acid
  - dl-Malic acid
  - Raw ginger extract component
  - Glycyrrhizic acid dipotassium salt
  - Polyethylene glycol (molecular weight about 20,000)
  - Gum component
- 5 Footnote: The number inside O shows the number of the reference example for the manufacture of various raw ginger extracts.

#### Comparative Example 1

A powdered hair detergent was obtained in the same manner except that no raw ginger extract was used in Application Example 1.

#### Comparative Example 2

A powdered hair detergent was obtained in the same manner except that no carbonates were used in Application Example 1.

#### Comparative Example 3

A powdered hair detergent was obtained in the same manner except that no raw ginger extract or carbonates were used in Application Example 1.

#### Comparative Example 4

A powdered hair detergent was obtained in the same manner as in Application Example 1 except that 0.5% salicylic acid and 0.5% of a senpuri [transliteration] extract were used instead of the raw ginger extract in Application Example 1.

#### Comparative Example 5

A powdered hair detergent was obtained in the same manner as in Application Example 1 except that 0.5% each of urea and vitamin E was used instead of the raw ginger extract in Application Example 1.

For each of the application examples and each of the comparative examples, sensuous tests of the washing state were carried out by 20 testers. Tests were carried out for a total of 10 samples, including a total of five samples from each of the groups of Application Example 1, Application Examples 2-5, 6-9, 10-13, and 14-17, and a total of five samples from each of the comparative examples. As a result, the foaming condition, the foam texture, and so on during usage were all good in application examples and comparative examples. However, for Comparative Examples 2 and 3 without a carbon dioxide gas source, the amount of foam was

small. The comfortable feeling during use was poor for comparative examples containing no raw ginger extract or carbonate source, in comparison to the application examples. The rinsing ease and the foam removal during rinsing were also poor for Comparative Examples 2 and 3, in comparison to the application examples. The dirt removal condition was also poor for Comparative Examples 2 and 3 in which the amount of foam was small and rinsing was difficult. A stickiness and a loose feeling of hair after hair washing were frequently observed in comparative examples, especially Comparative Examples 2 and 3. Furthermore, the hair detergent of Application Example 1 of the present invention was subjected to actual usage tests on testers including 20 men and 20 women at a rate of once every two days for one month. As a result, there was no sense of incongruity, there was a comfortable usage, and the clean feeling after use was also excellent. The hair after washing was free from stickiness. It was gentle and its touch was good. Even if no other hair care material was used, no dandruff, itching or other problems occurred. It was clarified that a hair growing effect was also expected.

In order to observe the hair growing effect of the hair detergents obtained in Application Examples 1-17 and Comparative Examples 1-5, the following tests were carried out.

#### Test 3

With 10 male rabbits of the New Zealand white species with a body weight of about 2.5 kg as a group, hair was removed from the back. Only those in the rest phase were used in the tests. A 0.2 g test sample was coated on the back after hair removal for those in the rest phase for two days a week for 30 days or 60 days and then washed. The number of days required to convert the rest phase hair to the growth phase hair was investigated. The results are shown in Table 1. In the table, the "number of days accelerated" shows the number of days accelerated for the conversion of the rest phase hair to the growth phase hair in comparison to the case of coating with a detergent containing no test substances, that is, without containing a carbon dioxide gas generating source and a raw ginger extract agent.



Table 1

① 摘要		② 育毛効果	
③ 実施例	④ 促進日数	⑤ 総合判定	
1	2 6	著効	⑥
2	2 5	著効	
3	2 0	有効	⑦
4	2 0	有効	
5	1 8	有効	
6	2 5	著効	⑥
7	2 1	有効	⑦
8	2 2	有効	
9	2 1	有効	
1 0	2 6	著効	⑥
1 1	1 9	有効	⑦
1 2	2 1	有効	
1 3	2 2	有効	
1 4	2 9	著効	⑥
1 5	1 9	有効	⑦
1 6	2 0	有効	
1 7	1 8	有効	
比較例			
1	1 5	有効	⑦
2	1 6	有効	
3	2	無効	⑨
4	1 0	やや有効	⑩
5	1 2	やや有効	

- Key:
- 1 Summary
  - 2 Hair growing effect
  - 3 Application Example
  - 4 Number of days accelerated
  - 5 Overall judgment
  - 6 Remarkably effective
  - 7 Effective
  - 8 Comparative Example
  - 9 Ineffective
  - 10 Somewhat effective

#### Test 4

Furthermore, for the hair detergent compositions obtained in the application examples and comparative examples described previously, their performance comparative tests were carried out by the following test methods. The results are shown in Table 2. Hair was removed from the back of Hartley type male guinea pigs with a body weight of 250-350 g. For the length of hair in one week and four weeks after hair removal and the length of hair elongated in one week during the test period, 20 pieces of hair were measured for each of the test samples. The average values were determined.

It was found from these results that the hair detergent compositions of the present invention had an extremely remarkable hair cultivating effect in comparison to guinea pigs washed with detergents containing conventional pharmaceutically effective components in their hair growing rates and guinea pigs washed with detergents containing no pharmaceutically effective components at all as controls.

Table 2

③ 実験例	① 1週間		② 2週間		② 3週間		② 4週間	
	④ 毛長 (mm)	⑤ 週間伸	④ 毛長	⑤ 週間伸	④ 毛長	⑤ 週間伸	④ 毛長	⑤ 週間伸
1	6.0	—	13.8	7.8	21.7	7.9	28.3	6.6
2	5.9	—	13.4	7.5	21.1	7.7	27.3	6.2
3	5.0	—	12.1	7.1	19.1	7.0	24.3	5.2
4	5.2	—	12.1	7.0	19.3	7.1	24.2	4.9
5	5.3	—	12.1	6.9	19.3	7.1	23.8	4.5
6	6.2	—	14.0	7.8	21.9	7.9	28.0	6.1
7	5.0	—	12.2	7.2	19.2	7.0	25.2	6.0
8	5.1	—	12.4	7.3	19.5	7.1	24.3	4.8
9	5.0	—	12.5	7.5	19.7	7.2	24.3	4.6
10	6.5	—	14.4	7.9	22.4	8.0	28.4	6.0
11	5.9	—	12.7	6.8	19.5	6.8	23.7	4.2
12	5.8	—	13.0	7.2	20.2	7.2	24.8	4.6
13	5.9	—	13.4	7.5	20.7	7.3	25.6	4.9
14	6.0	—	14.0	8.0	21.9	7.9	28.2	6.3
15	5.2	—	12.8	7.6	20.0	7.2	24.5	4.5
16	5.9	—	13.0	7.1	20.0	7.0	24.4	4.4
17	5.1	—	12.4	7.3	19.6	7.2	23.9	4.3
⑥ 比較例								
1	5.0	—	11.2	6.2	17.7	6.5	21.7	4.0
2	5.3	—	11.9	6.6	18.5	6.6	22.7	4.2
3	5.0	—	10.0	5.0	15.1	5.1	18.1	3.0
4	4.9	—	11.0	6.1	17.3	6.3	21.4	4.1
5	5.0	—	11.3	6.3	17.6	6.3	21.8	4.2

Key: 1 Week  
 2 Weeks  
 3 Application Example  
 4 Hair length  
 5 Weekly elongation  
 6 Comparative Example

It is seen from this table that the hair detergent of the present invention blended with a carbon dioxide gas generating source and a raw ginger extract agent has a remarkable hair growing effect.

#### Test 5

The hair detergent compositions of the application examples described previously were subjected to skin irritation experiments by the closed batch test with respect to 25 healthy persons. As a result, they were all negative (0% positive).

Thus, all of the components of the hair detergent of the present invention have high safety.

#### Effect of the invention

The hair detergent composition of the present invention is a material exhibiting a solid form in a white powder state, granular state, tablet state or the like as long as no coloring agent is used. Caking, foaming or the like does not occur even after storage for a long period of time. It is extremely good in product safety. It can be dispersed or dissolved in water or warm water smoothly, easily, and uniformly with affinity. The washing action and the washing effect due to the foaming effect as the objectives of the present invention are available, of course. It is a material exhibiting remarkable hair cultivating and hair growing effectiveness due to the synergistic effect of pharmaceutically effective components of the raw ginger extract and carbon dioxide gas. It is a material with an extremely high usefulness. Furthermore, it is free from adverse irritation with respect to hair, the scalp, etc. The finishing feel is smooth and the gentle feeling is not damaged. Moreover, since it is in a solid form, packaging and so on are simple and easy. It can be in separate packs, one pack, or a sprinkling type. Its product package form is versatile. Furthermore, since it is lightweight, it is convenient to carry, etc. In addition, the container cost, the transportation cost, and other costs can be decreased in comparison to a liquid detergent. It has a high commercial product value. It is an entirely novel hair detergent composition.